ANNUAL PATTERN OF ACTIVITY OF THE BROWN TREE SNAKE (*BOIGA IRREGULARIS*) IN SOUTHEASTERN QUEENSLAND

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Bull, K.H. & Whittier, J.M. 1996 07 20: Annual pattern of activity of the Brown Tree snake (*Boiga irregularis*) in southeastern Queensland. *Memoirs of the Queensland Museum* **39**(2): 483-486. Brisbane. ISSN 0079-8835.

Dates of collection of *Boiga irregularis* from SE Queensland in the Queensland Museum indicate adult snakes were most commonly collected in January, February and March, the warmest and wettest months. Juvenile snakes were less numerous than adults, but were represented in all months of the year, with peaks in January and April. Few females were collected during final stages of egg development, and few gravid females are represented. These observations support field observations that suggest adults are most active in the warm, wet summer months and that females are relatively inactive during late ovarian development and when gravid. □ *Seasonality, Reptilia, Colubridae, Boiga, introduced species, Queensland.*

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The activity of reptilian species may be confined to certain months of the year. In tropical regions, where temperatures are relatively warm and stable throughout the year, many species are active all year round. However, some reptiles in these areas have depressed activity during the tropical 'winter'. This is believed to be a consequence of the low levels of humidity related to the dry season, rather than a consequence of temperature (Shine, 1991a). Even in temperate regions, high humidity seems to stimulate greater snake movement. The apparent relations of snake activity to seasonal changes in temperature and rainfall have prompted this investigation into the annual activity cycle of the arboreal brown tree snake, *Boiga irregularis*, in SE Queensland.

B. irregularis is a colubrid from coastal Australia, Papua New Guinea and islands in NW Melanesia and Indonesia (Cogger, 1992). On Guam (13°N), where it has been introduced, the snake causes a major impact on the power supply of the island by climbing on electrical wires and producing electrical shorts (Fritts et al., 1984). The Naval Public Works Command maintain a log of these occurrences, which has allowed evaluation of activity patterns of the snakes over several years. The seasonal incidence of *B. irregularis* is linked with monthly rainfall similar to other arboreal tropical snakes (Henderson et al., 1978). Peak activity occurs in May, June and July, the months that generally show an increase in rainfall after 7 months of steadily declining precipitation (Fritts et al., 1984).

Although activity of *B. irregularis* in Australasia has not been documented it has been inferred from study of its reproductive habits (Shine, 1991b; Whittier & Limpus, 1996). During late spring and summer *B. irregularis* is encountered in SE Qld, including urban areas. However, in the winter it is more secretive. Being nocturnal and arboreal means that the behaviour of *B. irregularis* is likely to be strongly influenced by seasonal changes in the weather. It is a thermoconformer during its activity period.

To observe general fluctuations in *B. irregularis*' annual activity pattern, snakes were examined from the Queensland Museum (Appendix 1). This study was based around the general premise that the seasonal distribution of the species in the museum's collection is representative of the abundance of *B. irregularis* in natural populations. Therefore, fluctuations in the number of museum specimens over the year would indicate changing activity levels of the snake. Collections of *B. irregularis* from PNG and the wet tropics of Australia differ in being collected as biased samples on specific field trips. SE Qld specimens have been obtained generally from casual encounters, usually by the general public (J. Covacevich, pers. comm.). In the Queensland Museum's collection, reliable collection dates (as opposed to registration dates) began in the 1970's.

Observations of *B. irregularis* and by inference its activity level changes through the year (Figs 1-2). Adult snakes (>75cm) are most numerous in January, February and March. These months are both the warmest and wettest (Fig. 3). Adult snakes are least frequent during May-September, the cooler, drier months of the year. Numbers of

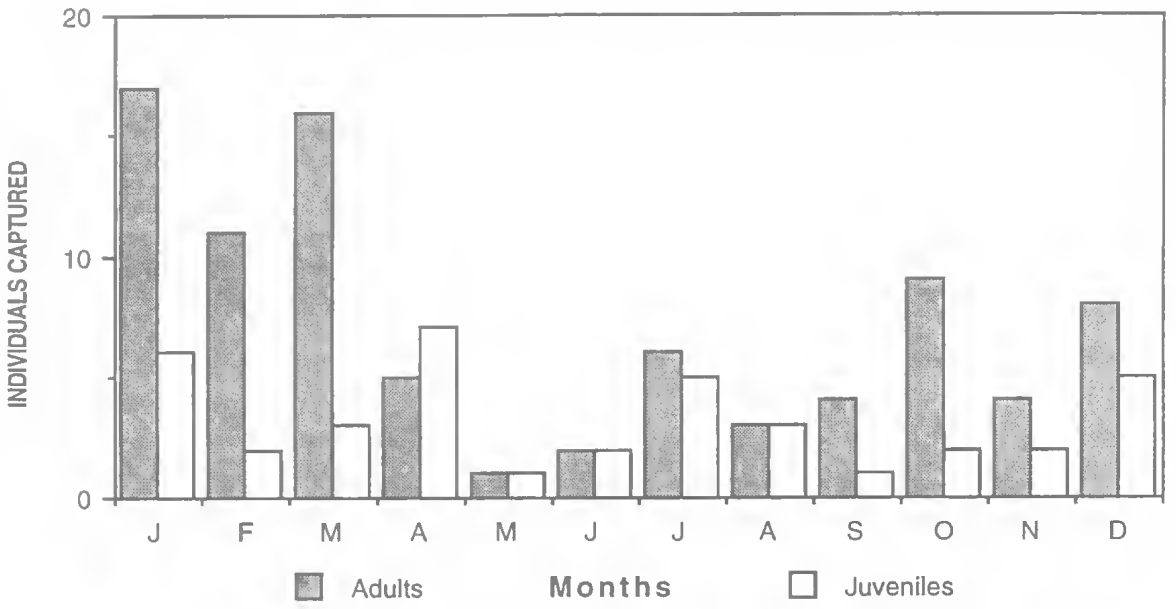

FIG. 1. Monthly incidence of adult and juvenile specimens of *Boiga irregularis* from SE Qld.

snakes only start to significantly increase in October, the first month of increased precipitation after 7 months of steadily declining rainfall. Temperatures begin their upward turn in September, a month earlier than the end of the dry season.

Juvenile snakes (<75cm) are less numerous than adults, however juveniles experience less of a decline in activity over winter, relative to their numbers (Fig 1). They persist at a more or less stable level throughout the year, although are most abundant in January and April.

Males are always more common than females in all months of the year (Fig.2). Both sexes experience declines in activity during April-September, however male snakes appear to emerge prior to females; greater numbers of males are found in October but greater numbers of females are found in December. Females also are underrepresented in February, and are found in higher numbers in late summer/autumn in March and April.

Seasonal fluctuations in the activity of *B. irregularis* in SE Qld appear linked with temperature and rainfall. When minimum temperatures fall below 15°C, snakes reduce their level of activity. These minimum temperatures represent the night time temperatures that occur when these nocturnal snakes are foraging and moving about. Although temperatures begin to increase in September, no significant increase in snake activity is observed until October. This may be due to the snake's minimum temperature threshold; that is, the need for temperatures above 15°C to stimulate activity. Otherwise, the onset of rains in October may explain appearance of snakes in this month.

Sexual differences in activity levels of this snake tend to skew the sex ratio of captured snakes. This is probably due to the more secretive nature of females, especially those in the final stages of egg development (September-December) and egg laying (particularly February). Males also tend to be more active in searching for mates and as a consequence may travel further distances than females and appear more active. The large increase in male activity in October may reflect this, as October is the time when spring matings are known to occur (Whittier & Limpus, 1996).

The temporary disappearance of females in the population during February is likely to be due to the occurrence of egg laying during this month. Females must be clandestine at this time, as very few are captured with enlarged ovulated follicles (from 227). Following egg laying, females may

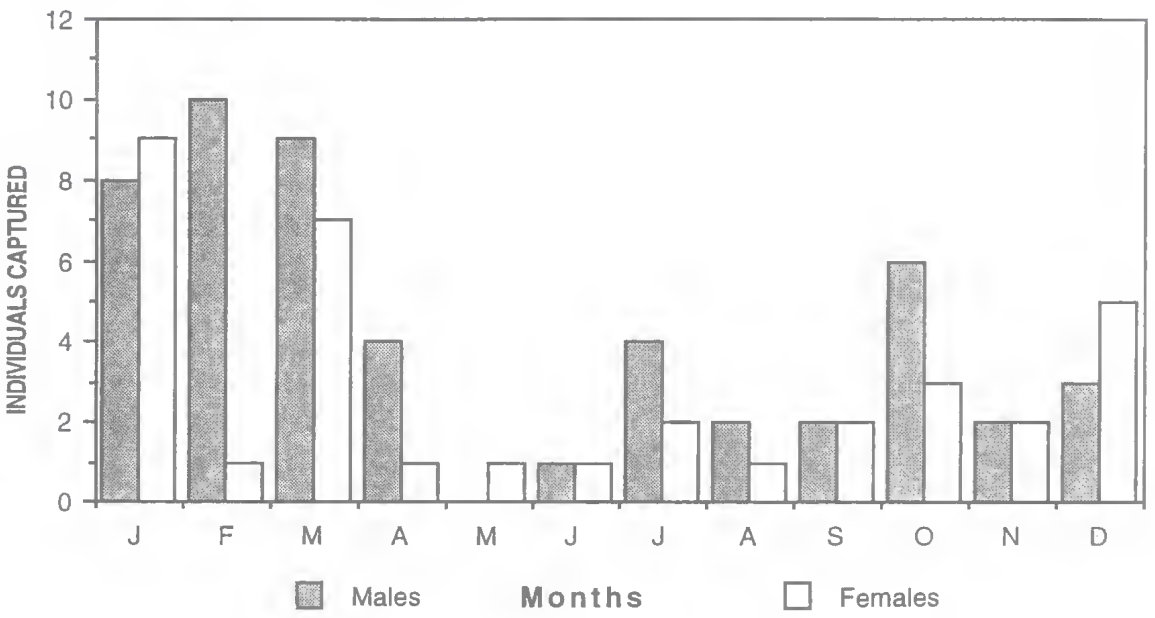

FIG. 2. Monthly incidence of male and female specimens of *Boiga irregularis* from SE Qld.

become active again, feeding to gain fat stores for winter dormancy. Similar observations of inactivity in gravid females have been made in Guam (R.T. Mason pers. comm.)

As incubation takes a minimum of 65 days in *B. irregularis* (Shine, 1991b), the small increase in juveniles in May could represent the emergence of hatchlings. These juveniles must grow and maintain themselves in the months following hatching and, as this does not occur until autumn, it explains the persistence of juveniles over the winter months.

The increase in acquisitions during July is misleading as it is caused by a group of 3 adult males and 2 juvenile males found in a winter aggregation. They were among 30-40 specimens of *B. irregularis, Dendrephalis punctulatus* and *Morelia spilota variegata* (Covacevich & Limpus, 1973). This winter aggregation of mixed species appeared not to be associated with breeding but with thermoregulatory behaviour (Covacevich & Limpus, 1973).

ACKNOWLEDGEMENTS

We thank Patrick Couper, Jeanette Covacevich and Glen Ingram, Queensland Museum for their enthusiastic support of our investigations. We also thank R.T. Mason for information about the Guam snakes.

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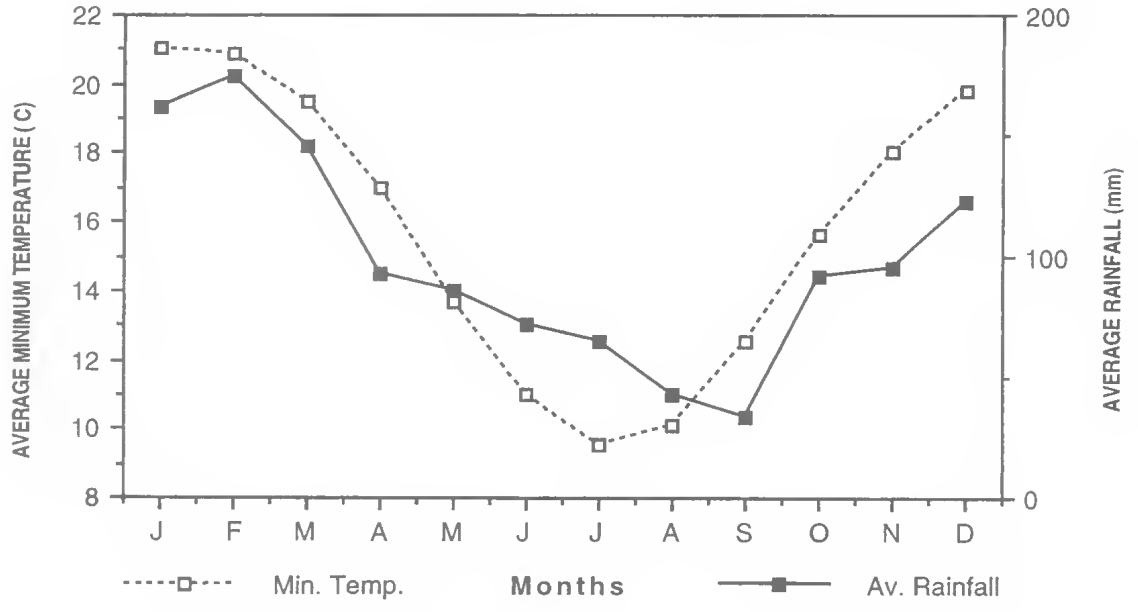

FIG. 3. Monthly mean minimum temperature (°C) and mean rainfall (mm) for Brisbane.

APPENDIX 1. Queensland Museum specimens of *Boiga irregularis* examined for this study.

QMJ11181; QMJ11269; QMJ11337; QMJ11495; QMJ11577; QMJ13512; QMJ14315; QMJ14503; QMJ14744; QMJ15554-QMJ15557; QMJ16104; QMJ16105; QMJ17518; QMJ17702; QMJ18101; QMJ18532; QMJ20295; QMJ22175; QMJ22412-QMJ22417; QMJ22461; QMJ22619; QMJ22622; QMJ22716; QMJ23163; QMJ23774; QMJ25382; QMJ25523; QMJ26906; QMJ28388; QMJ28392; QMJ28393; QMJ28477; QMJ28865; QMJ29007; QMJ30284; QMJ30960; QMJ30963; QMJ30965; QMJ31853; QMJ32238; QMJ32247; QMJ32266; QMJ35332; QMJ36056; QMJ36100; QMJ36754; QMJ36961; QMJ37146; QMJ37174; QMJ38166; QMJ40003; QMJ40278; QMJ40292; QMJ40293; QMJ40936; QMJ40949; QMJ41383; QMJ41393; QMJ41394; QMJ41506; QMJ43868; QMJ44240; QMJ46579; QMJ46860; QMJ47015; QMJ47312-QMJ47314; QMJ47320; QMJ47384; QMJ47396; QMJ47920; QMJ48104; QMJ48121; QMJ48128; QMJ48582; QMJ48599; QMJ48606; QMJ49851; QMJ49894; QMJ49906.